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**FGF10 controls the patterning of the tracheal cartilage rings via Shh.**

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**Authors:** Frederic G Sala, Pierre-Marie Del Moral, Caterina Tiozzo, Denise Al Alam, David Warburton, Tracy Grikscheit, Jacqueline M Veltmaat, Saverio Bellusci

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**Public Summary:**

**Scientific Abstract:**

During embryonic development, appropriate dorsoventral patterning of the trachea leads to the formation of periodic cartilage rings from the ventral mesenchyme and continuous smooth muscle from the dorsal mesenchyme. In this work, we have investigated the role of two crucial morphogens, fibroblast growth factor 10 and sonic hedgehog, in the formation of periodically alternating cartilaginous and non-cartilaginous domains in the ventral mesenchyme. Using a combination of gain- and loss-of-function approaches for FGF10 and SHH, we demonstrate that precise spatio-temporal patterns and appropriate levels of expression of these two signaling molecules in the ventral area are crucial between embryonic day 11.5 and 13.5 for the proper patterning of the cartilage rings. We conclude that the expression level of FGF10 in the mesenchyme has to be within a critical range to allow for periodic expression of Shh in the ventral epithelium, and consequently for the correct patterning of the cartilage rings. We propose that disturbed balances of Fgf10 and Shh may explain a subset of human tracheomalacia without tracheo-esophageal fistula or tracheal atresia.

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